

AfricaSign – A Crowd-sourcing Platform for the Documentation of STEM Vocabulary in African Sign Languages

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ABSTRACT

Research in sign languages, in general, is still a relatively new topic of study when compared to research into spoken languages. Most of African sign languages are endangered and severely under-studied [11]. In an attempt to (lexically) document as many endangered sign languages in Africa as possible, we have developed a low-barrier, online crowd-sourcing platform (AfricaSign) that enables the African deaf communities to document their sign languages. AfricaSign offers to users multiple input modes, accommodates regional variation in multiple sign languages and allows the use of avatar technology to describe signs. It is likely that this research will uncover typological features exhibited by African sign languages. Documentation of STEM vocabulary will also help facilitate access to education for the Deaf community.

Author Keywords

Sign language, Africa, documentation, avatar technology, STEM.

INTRODUCTION

Sign language is a visual/gestural language that is distinct from spoken language and has no text representation. SL is not gestural spoken language. Sign language can only be described, animated or videotaped.

Building on early works [9, 10, 16, 17], several computer applications have been developed to describe sign languages. By way of example, two major EU projects ViSiCAST and eSIGN built a technology for signing avatars. These projects used an XML description language (SiGML) which is based on HamNoSys notation [6] and Lebourque and Geibet's [9] gesture specification language (GessyCA). A system was developed to convert HamNoSys code of the given word to its SiGML form, to enable the animation of the avatar.

In this work, we present AfricaSign, a novel and easy-to-use crowd-sourcing web-based platform for the

documentation of Early Grade and STEM Vocabulary in African Sign Languages. Lessons learned from previous efforts to create community-driven online resources as well as other related work have been taken into account [1, 2, 3, 4, 12, 14, 15]. Our work is unique in that it offers to users multiple input modes, accommodates regional variation in multiple sign languages and allows the use of avatar technology to describe signs.

SYSTEM DESCRIPTION

Documentation is categorized by country and region to accommodate regional variation for the same language. The design of the crowd-sourcing platform takes into account the quality assurance of the documented signs, and the platform enables users to login and describe themselves demographically by country and region and deafness affiliation (e.g., deaf themselves, have deaf parents (CODA)). As a starting point, the database of words for which we are seeking signs is based on an enhanced version of MacArthur-Bates Communicative Development Inventory Words [5]. Users can choose the language of the platform (Arabic, English, German, or French) and add their signs using one of the following three modes:

- (1) Uploading a video sign if available
- (2) Videotaping a sign using Laptop/Tablet/Phone cam
- (3) Describing the sign using an avatar: this mode operates by having users identify:
 - (i) Manual markers for each hand. The description of signs using the four cheremes is based on work done by the Institute for Disabilities Research and Training (IDRT) for American Sign Language as well as work on Moroccan Sign Language within the framework of two recent projects [14, 15]. The novelty of the current work is that we are using a user-friendly chereme-based strategy to animate an avatar.
 - (ii) Non-manual markers. Users can select the non-manual marker type by using drop-down pictorial menus.

Figure 1 shows an overview of the architecture of AfricaSign platform, including input modes, data storage and data analysis.

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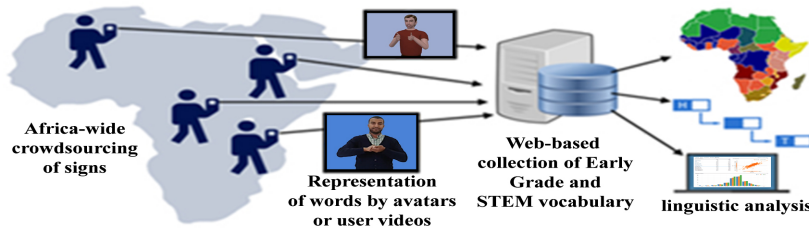


Figure 1: Overview of the AfricaSign platform

Figure 2 is a screenshot illustrating the three options users can use to contribute with signs: 1. describe the sign using an avatar, 2. upload video sign if available and 3. use the local camera (embedded in phone, tablet, or PC) to record the sign.

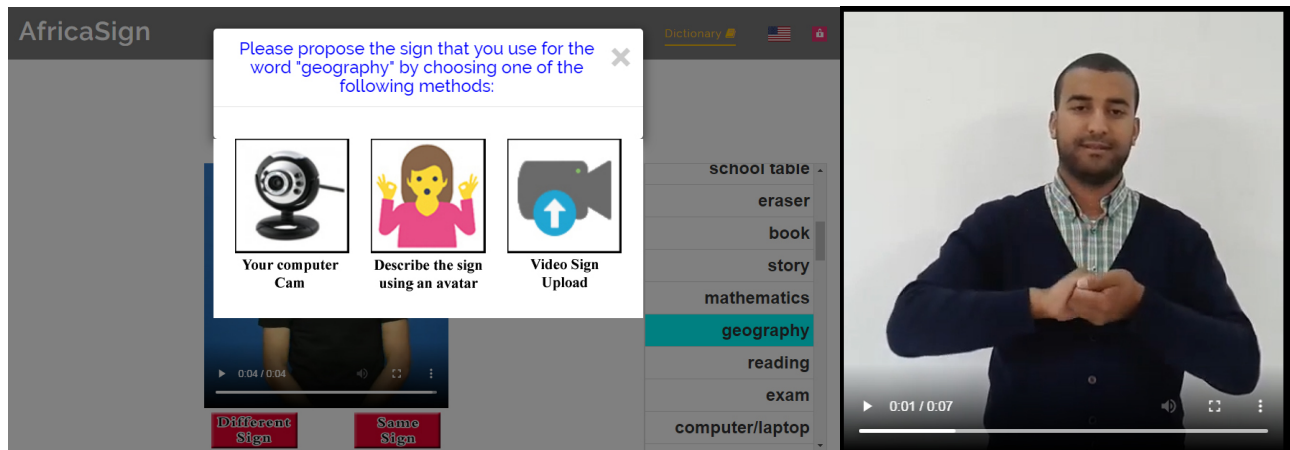


Figure 2: The web-based tool allows new signs to be captured via multiple options

APPLICATION'S RESEARCH IMPLICATIONS

The data collected through this platform will help answer fundamental technological and linguistic research questions about African sign languages and sign language typology more generally. Core research questions that are addressed are twofold:

- (i) Research questions in linguistics:
 - How can research on African sign languages further best practices for creating large scale digital resources of minority languages?
 - What is the nature/degree of variation?
 - Are there typologically unusual lexical features?
 - What are the theoretical implications of such features?
 - To what extent can language (lexical) documentation and conservation address negative attitudes about Deafness in Africa?
- (ii) Technology related questions:
 - Sign language representation and animation: How can a virtual signing avatar be designed to render it most suitable for displaying sign language, especially for a heterogeneous set of languages and cultures? In this context, we will address the 2 challenging tasks: (i) how to improve the quality of the signing avatar and (ii) in the absence of a standardized evaluation protocol, how to best evaluate a signing avatar.
 - Research framework for crowd-sourcing in Africa: How crowd-sourcing can be effectively used as a strategy to collect sign language data in a robust and reliable way.

USER MANAGEMENT

As mentioned above, users are categorized by country and region to accommodate regional variation. The role of users is to contribute with signs used in their own region for a pre-defined list of words.

Access to the platform has two phases:
 Phase I: a six-month restricted access phase. During this phase, only users with login information can access the platform. Currently, we have engaged partners from five African countries (Ethiopia, Ghana, Kenya, Ivory Coast and Morocco). Each country has a moderator who will coordinate with regional collaborators to identify contributors. Overall management of the platform is handled by the platform administrator and moderators. This phase serves as a testing protocol of AfricaSign. During this phase, we build on previous evaluation studies [7, 8, 13] and work towards a standardized evaluation protocol on how to best evaluate a signing avatar.
 Phase II: unrestricted access phase. During this phase, after the word has been spread and phase 1 learnt technical lessons have been addressed by the technical team, we expect to have an expanded network of collaborators throughout the African continent.

PLATFORM AVAILABILITY

The platform is available through the homepage <https://africa-sign.org> and is currently restricted to users with login information.

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